

## Supplemental Materials

Environmental Chemicals in Pregnant Women in the US: NHANES 2003-2004

Tracey J. Woodruff<sup>1</sup>, Ami R. Zota<sup>1</sup>, Jackie M. Schwartz<sup>1</sup>

<sup>1</sup>Program on Reproductive Health and the Environment, Department of Obstetrics, Gynecology, and Reproductive Sciences, University of California, San Francisco

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#### Additional information on sampling of pregnant women and specimen collection

A urine pregnancy test was completed on all female participants aged 12-59 years and menstruating females aged 8-11 years (analytic details available from NHANES (CDC 2006)). The supplemental sample of pregnant women consisted of: 1) women of childbearing age (15-39 years of age) who reported being pregnant at the initial screening interview, which was confirmed through the urine pregnancy test; or 2) women who reported not being pregnant at the screening interview but were classified as pregnant after the urine pregnancy test (Mirel et al. 2009). For the purpose of this study, pregnancy status was based solely on the urine pregnancy test results.

Participants provided both a spot urine and blood sample and were asked to fast prior to the examination: 9.5 hours (overnight) morning session subjects; and six hours for afternoon and evening session subjects. Blood samples were also collected from those who do not meet the fasting criteria.

#### Additional information on descriptive statistics analysis

We used proc descript in SUDAAN to calculate the geometric mean (GM), geometric standard error (GSE), and median percentile estimates. We used proc univariate in SAS, weighted by individual sample weights, to calculate 95<sup>th</sup> percentile estimates since SUDAAN does not produce reliable 95<sup>th</sup> percentile estimates when there are limited degrees of freedom (due to the relatively small number of pregnant women sampled for each chemical analyte).

Supplemental Table 1. Descriptive statistics for 163 chemical analytes measured in pregnant women participating in NHANES 2003-2004 survey.

Chemical analyte	N	LOD <sup>a</sup>	%> LOD	GM (GSE)	50 <sup>th</sup>	95 <sup>th</sup>
<b>Metals (blood; µg/L)</b>						
Cadmium	253	0.14	66	0.22 (0.01)	0.2	0.8
Lead (µg/dL)	253	0.28	94	0.68 (0.04)	0.6	1.8
Mercury						
Mercury (total)	253	0.20	89	0.67 (0.07)	0.7	3.4
Mercury (inorganic)	253	0.42	28	— <sup>b</sup>	<LOD	0.7
<b>Volatile organic compounds (VOCs) (blood; µg/L)</b>						
Benzene	89	0.024	38	— <sup>b</sup>	<LOD	0.2
Chlorobenzene	89	0.011	0	— <sup>b</sup>	<LOD	<LOD
1,2-Dichlorobenzene	87	0.10	0	— <sup>b</sup>	<LOD	<LOD
1,3-Dichlorobenzene	85	0.05	0	— <sup>b</sup>	<LOD	<LOD
1,4-Dichlorobenzene	89	0.12	40	— <sup>b</sup>	<LOD	20.0
1,2-Dibromo-3-chloropropane	76	0.10	0	— <sup>b</sup>	<LOD	<LOD
2,5-Dimethylfuran	77	0.012	4	— <sup>b</sup>	<LOD	<LOD
Ethylbenzene	89	0.024	59	— <sup>b</sup>	0.03	0.06
Dichloromethane (Methylene chloride)	75	0.07	0	— <sup>b</sup>	<LOD	<LOD
Trichloroethene	80	0.12	0	— <sup>b</sup>	<LOD	<LOD
Tetrachloroethene	87	0.048	9	— <sup>b</sup>	<LOD	0.06
Dibromomethane	89	0.03	5	— <sup>b</sup>	<LOD	<LOD
1,1-Dichloroethane	89	0.01	0	— <sup>b</sup>	<LOD	<LOD
1,2-Dichloroethane	88	0.01	0	— <sup>b</sup>	<LOD	<LOD
1,1-Dichloroethene	89	0.009	0	— <sup>b</sup>	<LOD	<LOD
<i>cis</i> -1,2-Dichloroethene	89	0.01	0	— <sup>b</sup>	<LOD	<LOD
<i>trans</i> -1,2-Dichloroethene	89	0.01	0	— <sup>b</sup>	<LOD	<LOD
1,2-Dichloropropane	89	0.008	0	— <sup>b</sup>	<LOD	<LOD
1,1,1-Trichloroethane	88	0.01	0	— <sup>b</sup>	<LOD	<LOD
1,1,2-Trichloroethane	88	0.01	0	— <sup>b</sup>	<LOD	<LOD
1,1,2,2-Tetrachloroethane	82	0.01	0	— <sup>b</sup>	<LOD	<LOD
Tetrachloromethane (Carbon tetrachloride)	88	0.005	1	— <sup>b</sup>	<LOD	<LOD
Hexachloroethane	89	0.011	0	— <sup>b</sup>	<LOD	<LOD
Methyl <i>tert</i> -butyl ether (MTBE)	85	0.002	86	0.01 (0.01)	0.02	0.1
Nitrobenzene	70	0.30	0	— <sup>b</sup>	<LOD	<LOD
Styrene	80	0.03	18	— <sup>b</sup>	<LOD	0.08
Toluene	90	0.025	94	0.07 (0.01)	0.1	0.2
<i>o</i> -Xylene	90	0.049	26	— <sup>b</sup>	<LOD	0.07
<i>m</i> - and <i>p</i> -Xylene	90	0.034	98	0.10 (0.01)	0.1	0.2
Bromodichloromethane (ng/l)	88	0.62	61	1.02 (0.21)	0.9	4.4
Dibromochloromethane (ng/l)	88	0.62	36	— <sup>b</sup>	<LOD	3.3
Tribromomethane (bromoform) (ng/l)	85	1.5	42	— <sup>b</sup>	<LOD	130.0
Trichloromethane (chloroform) (ng/l)	75	2.11	91	8.24 (1.89)	8.9	38.0
<b>Cotinine (serum; µg/L)</b>						
Cotinine	249	0.015	66	0.07 (0.02)	0.03	68.8
<b>Perfluorinated compounds (PFCs) (serum; µg/L)</b>						
Perfluorooctanoic acid (PFOA)	76	0.1	99	2.39 (0.24)	2.6	5.6
Perfluorooctane sulfonic acid (PFOS)	76	0.4	99	12.29 (1.02)	12.0	21.8

Perfluorohexane sulfonic acid (PFHxS)	76	0.3	90	1.14 (0.19)	1.2	5.0
<b>Chemical analyte</b>	<b>N</b>	<b>LOD</b>	<b>%&gt; LOD</b>	<b>GM (GSE)</b>	<b>50<sup>th</sup></b>	<b>95<sup>th</sup></b>
2-(n-Ethyl-perfluorooctane sulfonamido) acetic acid (Et-PFOSA-AcOH)	76	0.4	0	— <sup>b</sup>	<LOD	<LOD
2-(n-Methyl- perfluorooctane sulfonamido) acetate (Me-PFOSA-AcOH)	76	0.6	16	— <sup>b</sup>	<LOD	1.0
Perfluorodecanoic acid (PFDeA)	76	0.3	8	— <sup>b</sup>	<LOD	0.4
Perfluorobutane sulfonic acid (PFBuS)	76	0.4	1	— <sup>b</sup>	<LOD	<LOD
Perfluoroheptanoic acid (PFHpA)	76	0.3	11	— <sup>b</sup>	<LOD	0.4
Perfluorononanoic acid (PFNA)	76	0.1	99	0.70 (0.05)	0.7	1.5
Perfluorooctane sulfonamide (PFOSA)	76	0.2	15	— <sup>b</sup>	<LOD	0.3
Perfluoroundecanoic acid (PFUA)	76	0.3	1	— <sup>b</sup>	<LOD	<LOD
Perfluorododecanoic acid (PFDoA)	76	1.0	0	— <sup>b</sup>	<LOD	<LOD
<b><i>Polybrominated diphenyl ethers (PBDEs) and brominated flame retardants (serum; ng/g lipid)</i></b>						
PBB-153	75	0.8	80	0.95 (0.12)	1.1	3.2
PBDE-17	74	1.0	11	— <sup>b</sup>	<LOD	— <sup>c</sup>
PBDE-28	75	0.8	90	1.27 (0.15)	1.3	3.8
PBDE-47	75	4.2	99	23.90 (2.21)	23.7	100.0
PBDE-66	72	1.0	16	— <sup>b</sup>	<LOD	— <sup>c</sup>
PBDE-85	73	2.4	33	— <sup>b</sup>	<LOD	— <sup>c</sup>
PBDE-99	75	5.0	87	5.51 (0.81)	5.1	21.8
PBDE-100	75	1.4	99	6.06 (0.91)	6.6	23.2
PBDE-153	75	2.2	100	9.90 (3.04)	7.8	127.0
PBDE-154	75	0.8	64	0.63 (0.05)	— <sup>c</sup>	— <sup>c</sup>
PBDE-183	74	1.7	10	— <sup>b</sup>	<LOD	— <sup>c</sup>
<b><i>Polychlorinated biphenyls (PCBs) (serum; ng/g lipid)</i></b>						
PCB-28	75	1.7	100	4.65 (0.70)	5.2	9.8
PCB-44	75	0.4	100	1.99 (0.27)	2.0	4.1
PCB-49	74	0.4	100	1.28 (0.18)	1.3	2.7
PCB-52	75	0.8	100	2.69 (0.40)	3.0	6.0
PCB-66	75	0.8	100	1.27 (0.16)	1.2	2.6
PCB-74	75	0.8	100	2.87 (0.55)	2.4	7.4
PCB-81 (pg/g)	75	13.1	50	— <sup>b</sup>	— <sup>c</sup>	— <sup>c</sup>
PCB-87	75	0.4	92	0.73 (0.10)	0.9	2.1
PCB-99	75	0.6	100	2.87 (0.40)	2.5	9.6
PCB-101	75	0.6	100	1.58 (0.19)	1.8	3.8
PCB-105	74	0.4	100	1.07 (0.22)	0.9	3.3
PCB-110	74	0.8	100	1.10 (0.15)	1.3	3.4
PCB-118	75	0.6	100	4.31 (0.95)	3.6	14.3
PCB-126 (pg/g)	75	13.9	94	15.77 (5.32)	— <sup>c</sup>	74.8
PCB-128	74	0.4	20	— <sup>b</sup>	<LOD	— <sup>c</sup>
PCB-138 and -158	75	0.4	100	7.70 (1.24)	7.3	20.2
PCB-146	75	0.4	99	1.01 (0.15)	1.1	3.1
PCB-149	75	0.4	98	0.51 (0.06)	0.5	1.6
PCB-151	74	0.4	81	0.19 (0.03)	— <sup>c</sup>	0.7
PCB-153	75	1.1	100	8.74 (1.29)	8.8	22.5
PCB-156	74	0.4	90	1.01 (0.27)	1.2	3.0
PCB-157	73	0.4	59	— <sup>b</sup>	— <sup>c</sup>	1.0
PCB-167	74	0.4	54	— <sup>b</sup>	— <sup>c</sup>	1.1
PCB-169 (pg/g)	75	15.9	45	— <sup>b</sup>	<LOD	— <sup>c</sup>

PCB-170	74	0.4	99	2.08 (0.32)	2.5	6.0
PCB-172	74	0.4	40	— <sup>b</sup>	<LOD	0.8
Chemical analyte	N	LOD	%> LOD	GM (GSE)	50 <sup>th</sup>	95 <sup>th</sup>
PCB-177	74	0.4	83	0.53 (0.12)	0.7	1.6
PCB-178	74	0.4	78	— <sup>c</sup>	0.5	1.0
PCB-180	75	0.4	96	4.61 (0.99)	6.8	13.2
PCB-183	74	0.4	88	0.62 (0.13)	0.9	1.9
PCB-187	75	0.4	96	1.66 (0.28)	2.5	4.1
PCB-189	73	0.4	11	— <sup>b</sup>	<LOD	0.4
PCB-194	73	0.4	78	0.65 (0.20)	1.2	3.5
PCB-195	73	0.7	54	— <sup>b</sup>	— <sup>c</sup>	0.9
PCB-196 and -203	74	0.4	89	0.86 (0.24)	1.1	2.8
PCB-199	71	0.4	88	0.84 (0.24)	1.1	2.9
PCB-206	74	0.7	97	0.73 (0.11)	0.9	2.0
PCB-209	75	0.7	96	— <sup>c</sup>	— <sup>c</sup>	3.2

**Polychlorinated dioxins and furans (serum; pg/g lipid)**

1,2,3,7,8-Pentachlorodibenzo- $\rho$ -dioxin (PeCDD)	75	4.5	34	— <sup>b</sup>	<LOD	4.5
1,2,3,4,7,8-Hexachlorodibenzo- $\rho$ -dioxin (HxCDD)	75	11.9	29	— <sup>b</sup>	<LOD	— <sup>c</sup>
1,2,3,6,7,8-Hexachlorodibenzo- $\rho$ -dioxin (HxCDD)	75	12.3	83	— <sup>c</sup>	— <sup>c</sup>	20.0
1,2,3,7,8,9-Hexachlorodibenzo- $\rho$ -dioxin (HxCDD)	75	12.3	36	— <sup>b</sup>	<LOD	— <sup>c</sup>
1,2,3,4,6,7,8-Heptachlorodibenzo- $\rho$ -dioxin (HpCDD)	75	13.0	100	21.87 (3.68)	21.1	40.8
1,2,3,4,6,7,8,9-Octachlorodibenzo- $\rho$ -dioxin (OCDD)	74	218.0	94	— <sup>c</sup>	— <sup>c</sup>	360.0
2,3,7,8-Tetrachlorodibenzo- $\rho$ -dioxin (TCDD)	75	3.8	11	— <sup>b</sup>	<LOD	— <sup>c</sup>
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	74	6.0	2	— <sup>b</sup>	<LOD	<LOD
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	74	7.1	0	— <sup>b</sup>	<LOD	<LOD
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	74	6.8	65	— <sup>c</sup>	— <sup>c</sup>	— <sup>c</sup>
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	74	7.4	38	— <sup>b</sup>	<LOD	— <sup>c</sup>
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	75	7.9	31	— <sup>b</sup>	<LOD	— <sup>c</sup>
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	75	8.3	0	— <sup>b</sup>	<LOD	<LOD
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	75	8.2	4	— <sup>b</sup>	<LOD	<LOD
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	75	8.6	92	— <sup>c</sup>	— <sup>c</sup>	13.1
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	75	8.6	1	— <sup>b</sup>	<LOD	<LOD
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	75	12.0	21	— <sup>b</sup>	<LOD	— <sup>c</sup>

**Organochlorine pesticides (serum; ng/g lipid)**

Aldrin and Dieldrin						
Aldrin	71	7.8	0	— <sup>b</sup>	<LOD	<LOD
Dieldrin	71	7.8	84	— <sup>c</sup>	— <sup>c</sup>	— <sup>c</sup>
Chlordane and Heptachlor						
Oxychlordane	72	7.8	81	— <sup>c</sup>	— <sup>c</sup>	11.4
Heptachlor epoxide	72	7.8	35	— <sup>b</sup>	<LOD	10.3
<i>trans</i> -Nonachlor	70	7.8	94	— <sup>c</sup>	— <sup>c</sup>	16.9
Dichlorodiphenyltrichloroethane (DDT)						
<i>p,p'</i> - Dichlorodiphenyltrichloroethane (DDT)	71	7.8	62	— <sup>c</sup>	— <sup>c</sup>	37.4
<i>p,p'</i> - Dichlorodiphenyldichloroethene (DDE)	71	7.8	100	140.39 (29.72)	99.9	850.0
<i>o,p'</i> - Dichlorodiphenyltrichloroethene	71	7.8	3	— <sup>b</sup>	<LOD	<LOD

Chemical analyte	N	LOD	%> LOD	GM (GSE)	50 <sup>th</sup>	95 <sup>th</sup>
Endrin	71	7.8	0	— <sup>b</sup>	<LOD	<LOD
Hexachlorobenzene	70	7.8	100	11.27 (1.08)	10.4	25.7

Hexachlorocyclohexane						
<i>beta</i> - Hexachlorocyclohexane	72	7.8	80	— <sup>c</sup>	— <sup>c</sup>	22.0
<i>gamma</i> - Hexachlorocyclohexane (Lindane)	72	7.8	0	— <sup>b</sup>	<LOD	<LOD
Mirex	70	7.8	8	— <sup>b</sup>	<LOD	2.8
<b><i>Organophosphate insecticide (OP) metabolites (urine; µg/L)</i></b>						
Dimethylphosphate (DMP)	89	0.5	44	— <sup>b</sup>	<LOD	13.7
Diethylphosphate (DEP)	89	0.1	33	— <sup>b</sup>	<LOD	10.8
Dimethylthiophosphate (DMTP)	89	0.5	83	2.43 (0.43)	2.7	16.0
Diethylthiophosphate (DETP)	87	0.2	57	— <sup>b</sup>	0.2	2.2
Dimethyldithiophosphate (DMDTP)	86	0.1	56	— <sup>b</sup>	0.2	3.2
Diethyldithiophosphate (DEDTP)	89	0.1	8	— <sup>b</sup>	<LOD	0.4
<b><i>Environmental phenols (urine; µg/L)</i></b>						
Bisphenol A	86	0.4	96	2.53 (0.63)	2.7	15.0
Triclosan	86	2.3	87	17.00 (8.74)	8.2	283.0
Benzophenone-3	86	0.3	100	25.49 (6.52)	16.9	353.0
4- <i>tert</i> -Octylphenol	86	0.2	69	0.38 (0.07)	0.5	3.0
<b><i>Phthalates (urine; µg/L)</i></b>						
Benzylbutyl phthalate						
Mono-benzyl phthalate (MBzP)	91	0.1	100	15.12 (3.79)	17.8	86.8
Dibutyl phthalate						
Mono-isobutyl phthalate (MiBP)	91	0.3	99	3.47 (0.84)	4.4	19.5
Mono- <i>n</i> -butyl phthalate (MnBP)	91	0.4	99	18.83 (4.11)	17.1	143.8
Dicyclohexyl phthalate						
Mono-cyclohexyl phthalate (MCHP)	91	0.2	8	— <sup>b</sup>	<LOD	0.4
Diethyl phthalate						
Mono-ethyl phthalate (MEP)	91	0.4	100	226.53 (79.03)	265.7	2263.0
Di-2-ethylhexyl phthalate						
Mono-2-ethylhexyl phthalate (MEHP)	91	0.9	89	3.34 (0.53)	3.3	39.9
Mono-(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP)	91	0.3	100	21.42 (3.34)	16.2	136.4
Mono-(2-ethyl-5-oxohexyl) phthalate (MEOHP)	91	0.5	99	17.81 (2.79)	13.7	110.1
Mono-(2-ethyl-5-carboxypentyl) phthalate (MECPP)	91	0.3	100	32.87 (4.36)	29.8	133
Di-isononyl phthalate						
Mono-isononyl phthalate (MiNP)	91	1.0	3	— <sup>b</sup>	<LOD	<LOD
Dimethyl phthalate						
Mono-methyl phthalate (MMP)	91	1.0	46	— <sup>b</sup>	<LOD	15.8
Di-( <i>n</i> -octyl) phthalate						
Mono-(3-carboxypropyl) phthalate (MCP)	91	0.2	99	2.16 (0.46)	2.2	11.6
Mono- <i>n</i> -octyl phthalate (MOP)	91	1.0	1	— <sup>b</sup>	<LOD	<LOD
<b><i>Polycyclic Aromatic Hydrocarbons (PAHs) (urine; µg/L)</i></b>						
Fluorene						
2-Hydroxyfluorene	89	0.005	100	0.18 (0.03)	0.2	0.9
3-Hydroxyfluorene	88	0.005	100	0.05 (0.01)	0.05	0.3
9-Hydroxyfluorene	85	0.005	100	0.21 (0.04)	0.2	0.8
Naphthalene						
1-Naphthol	92	0.047	100	1.09 (0.18)	1.0	5.6
2-Naphthol	91	0.031	100	2.49 (0.59)	2.4	14.7
Phenanthrene						
1-Hydroxyphenanthrene	89	0.005	100	0.14 (0.02)	0.11	0.4

2-Hydroxyphenanthrene	87	0.005	100	0.06 (0.01)	0.05	0.2
3-Hydroxyphenanthrene	84	0.005	100	0.06 (0.01)	0.06	0.3
4-Hydroxyphenanthrene	86	0.005	96	0.02 (0.004)	0.03	0.1
Pyrene						
1-Hydroxypyrene	86	0.005	100	0.08 (0.02)	0.08	0.5

***Perchlorate (urine; µg/L)***

Perchlorate	89	0.05	100	0.22 (0.01)	4.3	34.0
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GM=Geometric mean; GSE= geometric standard error;

<sup>a</sup>For metals, VOCs, cotinine, PFCs, OP metabolites, phenols, phthalates, PAHs, and perchlorate, the LOD is constant across samples. However, for the persistent organic pollutants (PBDEs, PCBs, dioxins and furans, and organochlorine pesticides), each individual sample has its own LOD because the available sample volume differed by sample, and a higher sample volume results in a lower LOD. For chemicals with sample-specific LODs, the maximum LOD is reported. In general, the average LOD is approximately 40-50% of the maximum LOD (CDC, 2009).

<sup>b</sup>GM or GSE could not be calculated because detection frequency is less than 60%

<sup>c</sup>Geometric mean or percentile estimate is not reported because it is less than the maximum LOD.

Supplemental Table 2. Chemical analytes measured in each NHANES Subsample 2003-2004

Chemical Groups	Chemical Analytes Assessed in Subsample		
	A (n=76)	B (n=54)	C (n=59)
Metals	X	X	X
Cotinine	X	X	X
PFCs	X		
Organochlorine pesticides		X	
Phthalates		X	
PBDEs and BFRs		X	
PAHs		X	
Environmental phenols			X
Organophosphate insecticides			X
PCBs			X
Perchlorate			X

VOCs were measured in a special subsample, which only partially overlapped with subsamples A, B, and C